CURRENT STATUS OF THE CLAIMS

In the Claims

The following is a marked-up version of the claims with the language that is underlined ("___") being added and the language that contains strikethrough ("—") being deleted:

1. (Original) A waveguide system, comprising:

   a first substrate having an off-surface and curved optical waveguide disposed thereon, wherein the off-surface and curved optical waveguide includes a first portion and a second portion, wherein the first portion is substantially parallel to the first substrate, wherein the second portion extends curving away from the first substrate, wherein the first portion has a first end, a second end, a length, a width, and a thickness, wherein the second portion has a first end, a second end, a length, a width and a thickness, wherein the second end of the first portion is substantially adjacent and in-line with the first end of the second portion, wherein the first portion comprises an optically conductive first material, and wherein the first portion comprises an optically conductive second material.

2. (Original) The waveguide system of claim 1, wherein the optically conductive first material comprises a low modulus material selected from polyimides, epoxide, polynorbornenes, polyarylene ethers, and parylenes.

3. (Original) The waveguide system of claim 1, wherein the optically conductive second material comprises a low modulus material selected from polyimides, epoxide, polynorbornenes, polyarylene ethers, and parylenes.

4. (Original) The waveguide system of claim 1, wherein the optically conductive first material and the optically conductive second material are the same material.

5. (Original) The waveguide system of claim 1, wherein the optically conductive first material and the optically conductive second material are different materials.

6. (Original) The waveguide system of claim 1, wherein the first portion and the second portion have substantially the same thickness and width.

7. (Original) The waveguide system of claim 1, wherein the second end of the first portion and the first end of the second portion each have the same width, and wherein the width of the second portion expands wider from the first end to the second end.

8. (Original) The waveguide system of claim 1, wherein the second end of the first portion and the first end of the second portion each have the same thickness, and wherein the thickness of the second portion expands thicker from the first end to the second end.

9. (Original) The waveguide system of claim 1, wherein the width of the second portion expands wider from the first end to the second end and wherein the thickness of the second portion expands thicker from the first end to the second end.

10. (Original) The I/O interconnect system of claim 1, wherein the second end of the second portion forms a "Y"-shape, wherein the second end of the second portion has two off-surface and curved optical waveguide tips.

11. (Original) The waveguide system of claim 1, wherein the second portion is tapered in thickness from the second end to the first end.

12. (Original) The waveguide system of claim 1, wherein the second portion is tapered in width from the second end to the first end.

13. (Original) The waveguide system of claim 1, wherein the second portion is tapered in thickness from the second end to the first end and wherein the second portion is tapered in width from the second end to the first end.

14. (Original) The waveguide system of claim 13, further comprising at least one second layer disposed adjacent to a least a portion of the off-surface and curved optical waveguide.

15. (Original) The waveguide system of claim 14, wherein the second layer is substantially disposed between the off-surface and curved optical waveguide and the first substrate, and wherein the second layer is curved like the off-surface and curved optical waveguide.

16. (Original) The waveguide system of claim 14, wherein the second layer is substantially disposed on the off-surface and curved optical waveguide on the side opposite the first substrate, and wherein the second layer is curved like the off-surface and curved optical waveguide.

17. (Original) The waveguide system of claim 14, wherein the at least one second layer is selected from a waveguide cladding layer, an optical coupler layer, a capacitive coupler layer, a metal layer, and combinations thereof.

18. (Original) The waveguide system of claim 14, wherein the at least one second layer is selected from an electrical lead, a radio frequency lead, and combinations thereof.

19. (Original) The waveguide system of claim 1, wherein the first substrate has from about 1 off-surface and curved optical waveguide to about 500,000 off-surface and curved optical waveguides per centimeter squared of the first substrate.

20. (Original) The waveguide system of claim 1, wherein the off-surface and curved optical waveguide has a height of about 10 to 500 micrometers.

21. (Original) The waveguide system of claim 1, wherein the off-surface and curved optical waveguide has a thickness of about 0.1 to 500 micrometers and a width of about 0.1 to 500 micrometer.

22. (Original) The waveguide system of claim 1, further comprising:

a second substrate having at least one element adapted to receive the off-surface and curved optical waveguide.

23. (Original) The waveguide system of claim 1, wherein the second portion includes at least one portion substantially parallel to the first substrate and at least one portion curving away from the first substrate.

24. (Original) The waveguide system of claim 1, wherein the off-surface and curved optical waveguide is included in a distribution system selected from a clock distribution system and signal distribution system.

25. (Original) The waveguide system of claim 1, wherein the off-surface and curved optical waveguide is included in a microelectronic device.

26. (Original) The waveguide system of claim 1, wherein the off-surface and curved optical waveguide is included in a integrated optical device.

27. (Original) A method of directing optical energy, comprising:

providing a first substrate having an off-surface and curved optical waveguide disposed thereon, wherein the off-surface and curved optical waveguide includes a first portion and a second portion, wherein the first portion is substantially parallel to the first substrate, wherein the second portion extends curving away from the first substrate; and

communicating optical energy through the first off-surface and curved optical waveguide.

28. (Original) The method of claim 27, further comprising:

providing a second substrate having at least one element adapted to receive the off-surface and curved optical waveguide; and

communicating optical energy through the first off-surface and curved optical waveguide of the first substrate to the at least one element of the second substrate.

29. (Original) An input/output (I/O) interconnect system, comprising:

a first substrate having a first off-surface and curved optical waveguide disposed thereon, wherein the first off-surface and curved optical waveguide includes a first portion and a second portion, wherein the first portion is substantially parallel to the first substrate, wherein the second portion extends curving away from the first substrate, wherein the second portion has a coupler layer selected from an optical coupler layer and a capacitive coupler layer, disposed on the second portion, wherein the coupler layer is curved substantially the same as the first off-surface and curved optical waveguide;

a second substrate having a second off-surface and curved optical waveguide disposed thereon, wherein the second off-surface and curved optical waveguide includes a first portion and a second portion, wherein the first portion is substantially parallel to the first substrate, wherein the second portion extends curving away from the first substrate, wherein the second portion has a coupler layer selected from a optical coupler layer and a capacitive coupler layer, disposed on the second portion, wherein the coupler layer is curved substantially the same as the second off-surface and curved optical waveguide; and

wherein a top surface of the coupler layer of the first substrate and a top surface of the coupler layer of the second substrate are disposed adjacent one another and are communicatively coupled.

30. (Original) The I/O interconnect system of claim 29, wherein the first substrate includes a curved electrical lead disposed on a bottom side of the first off-surface and curved optical waveguide between a portion of the first off-surface and curved optical waveguide and the first substrate, wherein the second substrate includes an electrical lead disposed on an area of the second substrate adjacent the second off-surface and curved optical waveguide, wherein the curved electrical lead of the first substrate and the electrical lead of the second substrate are disposed adjacent one another and are communicatively coupled.

31. (Original) The I/O interconnect system of claim 29, wherein the first off-surface and curved optical waveguide includes at least one second layer selected from a waveguide cladding layer, a metal layer, and combinations thereof.

32. (Original) The I/O interconnect system of claim 29, wherein the second off-surface and curved optical waveguide includes at least one second layer selected from a waveguide cladding layer, a metal layer, and combinations thereof.

33. (Original) A method of directing energy, comprising:

providing a first substrate having a first off-surface and curved optical waveguide disposed thereon, wherein the first off-surface and curved optical waveguide includes a first portion and a second portion, wherein the first portion is substantially parallel to the first substrate, wherein the second portion extends curving away from the first substrate, wherein the second portion has a coupler layer selected from an optical coupler layer and a capacitive coupler layer, disposed on the second portion, wherein the coupler layer is curved substantially the same as the first off-surface and curved optical waveguide;

providing a second substrate having a second off-surface and curved optical waveguide disposed thereon, wherein the second off-surface and curved optical waveguide includes a first portion and a second portion, wherein the first portion is substantially parallel to the first substrate, wherein the second portion extends curving away from the first substrate, wherein the second portion has a coupler layer selected from an optical coupler layer and a capacitive coupler layer, disposed on the second portion, wherein the coupler layer is curved substantially the same as the second off-surface and curved optical waveguide, wherein a top surface of the coupler layer of the first substrate and a top surface of the coupler layer of the second substrate are disposed adjacent one another and are communicatively coupled; and

communicating optical energy through the first off-surface and curved optical waveguide of the first substrate and the second off-surface and curved optical waveguide of the second substrate.

34. (Original) The method of directing energy of claim 33, wherein the first substrate includes an electrical lead disposed on a bottom side of the first off-surface and curved optical waveguide between a portion of the first off-surface and curved optical waveguide and the first substrate, wherein the second substrate includes an electrical lead disposed on an area of the second substrate adjacent the second off-surface and curved optical waveguide, wherein the electrical lead of the first substrate and the electrical lead of the second substrate are disposed adjacent one another and are communicatively coupled; and further comprising:

communicating electrical energy through the electrical lead of the first substrate to the electrical lead contact of the second substrate.

35. (Original) A method for fabricating an off-surface and curved optical waveguide comprising:

providing a substrate;

disposing a sacrificial material onto at least one portion of the substrate;

disposing a stressed metal material onto a portion of the sacrificial material and a portion of the substrate;

disposing a waveguide material onto a portion of the stressed metal material; and

removing the sacrificial material.

36. (Original) A method for fabricating an off-surface and curved optical waveguide comprising:

providing a substrate;

disposing a sacrificial material on at least one portion of the substrate;

disposing a waveguide material on a portion of the sacrificial material and a portion of the substrate;

disposing a stressed metal material on a portion of the first material; and

removing the sacrificial layer.

37. (Original) A method for fabricating an off-surface and curved optical waveguide comprising:

providing a substrate;

disposing a waveguide material on a curved mold and a portion of the substrate; and

removing the mold.

38. (Original) A method of aligning substrates, comprising:

providing a first substrate having an off-surface and curved optical waveguide disposed thereon, wherein the off-surface and curved optical waveguide includes a first portion and a second portion, wherein the first portion is substantially parallel to the first substrate, wherein the second portion extends curving away from the first substrate, wherein the first portion has a first end, a second end, a length, a width, and a thickness, wherein the second portion has a first end, a second end, a length, a width and a thickness, wherein the second end of the first portion is substantially adjacent and in-line with the first end of the second portion, wherein the first portion comprises an optically conductive first material, wherein the first portion comprises an optically conductive second material, and wherein the first substrate has a first coefficient of thermal expansion; and

providing a second substrate having an optical element and having a second coefficient of thermal expansion, wherein the first coefficient of thermal expansion is different than the second coefficient of thermal expansion;

maintaining optical alignment between the first substrate and the second substrate.

39. (Original) A method of separating two microelectronic substrates, comprising:

providing a first substrate having a sacrificial layer disposed on the first substrate, a stressed metal layer disposed on the sacrificial layer, and a structure disposed on the stressed metal layer;

providing a second substrate, wherein the first substrate and the second substrate are bonded to one another on at least on position;

assembling the first and second substrate; and

removing the sacrificial layer, wherein upon removal of the sacrificial layer the stressed metal layer causes the structure to curve away from the first substrate and the movement of the structure causes the first substrate to move away from the second substrate.